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Device for producing film tracks from a film tube

The invention relates to a device and a process for producing film tracks from a tubular film

- with a lay-flat device, which preferably consists of two lay-flat plates arranged roof-like against each other,
- and a squeeze device, which preferably consists of squeeze roller pair and which compresses the film and
- is provided with at least one cutting device, which slits the film tube along its direction of conveyance.

Devices of this type are in general used together with tubular film extrusion systems. Often, a film tube is extruded, laid flat, squeezed and subsequently conveyed to a winding device. Particularly worthy of mention is that, as a rule, the tubular film track passes through a reversing device after the squeezing.

All the abovementioned function units are known in the printed literature. For example, DE 100 40 055 claims such a reversing device and also shows the related squeezing and lay-flat devices.
In order to transform the film tube into film tracks, one uses diverse cutting devices, which supplement the winding devices and slit the tubes directly before the beginning of the winding process. For that, in general, trimming cuts are made on both edges of the flat laid film tube. However, considerable waste is produced in this process. Since modern control processes can enable exact setting of the diameter of the extruded tubular film, and thus also the width of the flat laid film tube, trimming cuts are often dispensed with. Instead, slit knives are installed on the winding devices, which slit open the flat laid film tube track directly at its edges and thus avoid unnecessary waste.

This kind of production of film tracks from tubular films is, however, not suitable for thin, sensitive or sticky films. These films are also effected by the action of the slitting knife on the flat laid tubular films. Films of the aforementioned type are therefore still produced with the help of trimming cuts.

Consequently, the task of the present invention is to suggest a device, which enables production with gentle handling of flat films from tubular films.

The task is solved by

- providing at least one pre-squeeze roller in the direction of the conveyance of the film tube before the squeeze rollers (3),
- which leaves behind a remainder of air in the film tube, so that a static air cushion forms in the area between at least one pre-squeeze roller and the squeeze roller,
- and that the film tube can be slit with the cutting device in the area of the static air cushion.

By taking this measure, the aforesaid cutting device can slit open the film tube, intended whereby is the normal cutting, as well as the perforation of the tube, which can then be separated much later and can engage into the film tube that is not yet completely flat, without damaging the walls of the film. Thereby, the cutting of the film tube in the area of the static air cushion leads to straight cuts, which is not possible in the area of the blown films that are often fluttering, unstable and not pre-squeezed.

Here the static air cushion means the region, in which the still contained air in the film tube behaves more quietly than that in the region of the film tube lying before in the direction of conveyance of the film tube.
It is thereby advantageous to provide the pre-squeeze rollers between the lay-flat and the cutting device, so that even when the pre-squeeze roller lays the film tube almost flat, it still leaves a remainder of air in the film tube. The static air cushion which forms in this way prevents the knives of the cutting device from damaging the film tube and the film tracks.

It is of advantage, if the described pre-squeeze device consists of two squeeze rollers. In general they are at a larger distance from each other compared to that from the squeeze rollers.

Another preferred embodiment of the device for manufacturing of the film tracks consists of a reversing device which reverses the film tracks formed in the cutting process that lie flat above each other.

In the manufacture of adhesive tapes, it is particularly advantageous, if the adhesive tape layer forms the external periphery of the extruded film tube. In that way, the sticking together of two film tracks is prevented, especially during their common transportation through the reversing device.
An illustrative design of the invention is shown with the help of the figures and the description of the embodiment.

The individual figures show:

Fig. 1. A complete view of a device according to the invention
Fig. 2. A side view of the device
Fig. 3. A side view of a device according to the invention

Fig. 1 shows a device for manufacturing film tracks 7, 17 from a tubular film 1 according to the invention.

The film tube 1 extruded from the tubular film extrusion unit, not shown here, usually has a circular profile in the radial direction. A lay-flat device 2 is connected in the transportation direction z, which successively compresses the profile from two opposite sides. Behind the lay-flat device 2, the squeeze rollers 6 convey the film tube 1. The attendant pre-squeeze rollers 16 and 26 are at a distance from each other in such a way that the straight sides of the film tube 1 do not lie yet above each other. Since the films are still not completely squeezed, an air cushion remains in the film tube 1. Two cutting devices 4, 5 follow thereafter. Each of these cutting devices 4, 5 contains a knife 8, which is fixed on the machine frame in a manner, not shown in greater detail here. These knives 8 are arranged in such a way that they slit the film tube 1 open at its round edges. In the further course, the film tracks 7, 17 generated through the slitting pass through the squeeze device 3, which consists of two squeeze rollers 13, 23. This device serves the purpose of pressing the two film tracks 7, 17 flat on top of each other, and consequently for preventing capture of air between the two film tracks 7, 17. For the sake of elucidation, the film tracks 7, 17 are shown moving apart from each other in Fig. 1, however, they are conveyed to the reversing device, not displayed here, lying flat on top of each other. A suitable reversing device is described in greater detail, for instance, in the printed publication DE 100 40 055 Al. A common guide for the two films 7, 17, which lie above each other in a reversing device, is also technically possible in an another reversing embodiment. In that context, it is worthy of mention that there are also generic devices for manufacture of film tracks from tubular films, which manage completely without a reversing device.

The side view of the device according to the invention shown in Fig. 2 illustrates the process of the flat laying of the film tube in the lay-flat device 2, of which only the two sides of the lay-flat plates 12, 22 can be seen. One can clearly recognize that the subsequently following pre-squeeze rollers 16, 26 are at a fixed distance from each other. Depending, among other things, on the operating parameters, this distance is selected in such a way that there is yet an air cushion within the film tube at the level of the cutting device 4. Due to the air cushion, the parts of the film tube 1, which form the film tracks 7, 17 after slitting, have a somewhat larger distance from each other than while passing through the squeeze roller device. The squeeze rollers 13, 23 prevent the air from escaping through the pre-squeeze roller 3. This way the film tube can be slit laterally through contact with the knives 8 without the danger of damaging even very thin or sticky film tracks 7, 17.
In order to maintain sufficient pressure within the film tube, it can – considering the slit formed by the cutting device 4 – be necessary to continuously supply air to the film tube 1.
Devices, which can supply air continuously, are known. Thus, shutting heads are often employed to supply inner cooling air to the film tube.

Figure 3 shows once again the same device displayed in Fig. 2, whereby the reversing device 100 is also shown once again. After the film tracks 1,17 have passed through the squeeze rollers 3, they are conveyed together past the guide roller 101, the first idle roller 102, the first air turning bar 103, the second idle roller 104 and the first air turning bar 105. Finally, the film tracks 7, 17 reach a stationary roller through the delivering roller 106, which does not take part in the reversing process. Subsequently, the film tracks 7, 17 are conveyed to further processing or storage devices not displayed here. The distance between the film tracks 7, 17 from the squeeze rollers is displayed disproportionately large, in order to illustrate that there are two tracks. In general, film winders are built in first. Thereby, the film tracks can be winded up individually or together.

At this point it should be mentioned again that in Fig. 3 only the design in principle of an exemplary, very highly advanced reversing device was shown, whereby the holder of the film guiding elements 101 to 105 in the sketch, as well as the actual reversing process, which occurs due to the reversing movements of the rollers and the rods 103 to 105, around the vertical axis are not shown here. However, the method according to the invention covers all the reversing processes.

In addition to that, it should be emphasized once again, that the reversing devices, with the deviating numbers of idle rollers 102, 104 and angle bars 103, 105 are also known. In that context, reference be made once again to the printed publications, such as, for instance, DE 100 40 055, DE 43 03 952 or EP 0 873 845.

Of particular advantage are such tube reversing devices, in which a turning bar and an idle roller form a function pair. In such function pairs, the one idle roller and the one turning bar execute a reversing movement, which takes place with respect to an axis, oriented orthogonally to the rotation of the idle roller about its principal axis of symmetry. This axis is in general vertical and hence oriented in the main conveying direction of the film. Reversing devices with one, two or even three function pairs are known. The word function pair and its importance in the described reversing devices is described in the registered patent DE 100 40 055.

List of Reference Symbols	
1	Film tube
2	Lay-flat device
3	Squeeze roller device
4	Cutting device
5	Cutting device
6	Pre-squeeze device
7	Film track
8	Knife
9	Static air cushion
10	Arrow in the direction of conveyance of the film tube
11	
12	Bypass path
13	Squeeze roller
14	
15	
16	Pre-squeeze roller
17	Foil track
18	
19	
20	
21	
22	
23	Squeeze roller
24	
25	
26	Pre-squeeze roller
100 - 106	Film guide elements
z	Direction of conveyance of the film tube